

We claim:

1. An analyzer for capturing activity on a transmission medium, comprising:
  - (a) a data input port for receiving the activity from the transmission medium,
  - (b) replay logic for receiving the activity from the data input port and receiving stored activity from a trace buffer and sending out one or the other of these activities to the trigger logic, but not both,
  - (c) a trace buffer for receiving activity from said replay logic and storing it, and for sending stored activity to said replay logic and to a data output port,
  - (d) trigger logic for comparing the pattern of activity from the replay logic with a user-defined pattern of activity and indicating when they match,
  - (e) trace buffer control logic for causing activity from said replay logic to be either read from or written to said trace buffer,
  - (f) a data output port for transferring stored activity in the trace buffer elsewhere for processing or display, and
  - (g) a control port for controlling modes of operation of the analyzer and for accepting user-defined patterns for triggering.
2. An analyzer as recited in claim 1 wherein said trace buffer control logic includes logic for overwriting previously stored activity with new activity.
3. An analyzer as recited in claim 1 wherein said trace buffer control logic includes logic for avoiding overwriting previously stored activity with new activity.
4. An analyzer as recited in claim 1 further comprising selective capture logic for causing the trace buffer control logic to cause the activity from the replay logic to be written to the trace buffer only when the activity from said replay logic matches a second user-defined pattern of activity.
5. An analyzer as recited in claim 4 wherein said selective capture logic is capable of causing information about the type of activity from the replay logic that caused the activity to be written to said trace buffer to be incorporated into the activity stored in the trace buffer.

6. An analyzer as recited in claim 4 further comprising a timestamp counter for creating information about the time of occurrence of each activity event from the replay logic, so that such information may be incorporated into the activity stored in said trace buffer.

7. An analyzer as recited in claim 6,  
wherein said trigger logic includes time counters for incorporating the relative time of occurrence of an activity event as part of its activity pattern comparison, and  
wherein said replay logic uses said stored time-of-occurrence information to control the timing of the replay.

9. An analyzer as recited in claim 6 wherein said replay logic uses the stored time-of-occurrence information to control the timing of the replay.

10. An analyzer as recited in claim 9 further comprising a replay output port for sending the activity from the replay logic to a transmission medium.

11. An analyzer as recited in claim 1 wherein activity events are stored at a fixed frequency, thereby providing a fixed time between events.

12. An analyzer as recited in claim 1 wherein said trigger logic is able to recognize, for comparison purposes, patterns of activity that consist of a single event and patterns of activity that consist of a sequence of events.

13. An analyzer as recited in claim 1 wherein said trigger logic includes at least one counter for counting the number of occurrences of an activity event as part of its activity pattern comparison.

14. An analyzer as recited in claim 1 wherein said trigger logic includes time counters for using the relative time of occurrence of an activity event as part of its activity pattern comparison.

15. An analyzer as recited in claim 14 wherein said replay logic uses the fixed time between events to send the stored activity out with the same timing with which it was received at the data input port.

16. An analyzer as recited in claim 15 further comprising a replay output port for sending the activity from the replay logic to a transmission medium.

17. An analyzer for capturing activity on a transmission medium, the analyzer comprising:

- (a) a trace buffer for storing activity from a transmission medium,
- (b) replay logic for replaying data stored in said trace buffer, and
- (c) trigger logic for comparing a desired pattern of activity with data or a stream of data from said replay logic.

18. An analyzer as recited in claim 17 further comprising an input port for moving data from a transmission medium to said trace buffer.

19. An analyzer as recited in claim 17 further comprising trace buffer logic for writing data from a transmission medium to said trace buffer, and for reading information from said trace buffer.

20. An analyzer as recited in claim 17 wherein said trigger logic is capable of terminating data replay when a desired data pattern is found.

21. An analyzer as recited in claim 17 further comprising a control port from which a user may control modes of operation of the analyzer.

22. An analyzer as recited in claim 21 wherein said control port permits a user to select a desired data pattern for searching by use of said replay logic and said trigger logic.

23. An analyzer as recited in claim 17 wherein desired data patterns are located in data found in said trace buffer by said replay logic and said trigger logic rather than by a hardware search or a software search.

24. An analyzer for analyzing activity on a transmission medium, comprising:

- (a) a data input port for receiving the activity from the transmission medium,
- (b) a trace buffer for storing said received activity,

(c) replay logic for replaying stored activity in said trace buffer,  
(d) a control port for permitting a user to define a data pattern to be matched in said received activity, and  
(e) trigger logic for triggering an action based on a match between said data pattern and said replayed activity.

25. An analyzer as recited in claim 24 wherein said trigger logic includes the ability to latch address information of said match to a storage area.

26. An analyzer as recited in claim 25 wherein said storage area is a FIFO.

27. An analyzer as recited in claim 26 wherein said trigger logic has the ability to find multiple matches in said replayed activity.

26. An analyzer as recited in claim 25 wherein said replay function terminates on finding a match.

27. An analyzer as recited in claim 24 further comprising means for performing additional analysis of said stored activity.

28. An analyzer as recited in claim 27 wherein said means for performing additional analysis includes the ability to create a histogram.

29. An analyzer as recited in claim 27 wherein said means for performing additional analysis uses the same circuitry as said replay and trigger logic.

30. An analyzer as recited in claim 27 wherein said means for performing additional analysis includes real time protocol monitoring.

31. An analyzer as recited in claim 27 wherein said means for performing additional analysis includes real time statistical analysis.

32. An analyzer as recited in claim 27 wherein said means for performing additional analysis includes traffic generation.

33. An analyzer as recited in claim 24 wherein said replay logic function is carried out by a computer chip other than a microprocessor.

34. An analyzer as recited in claim 24 wherein said replay logic is implemented in computer hardware.

35. An analyzer as recited in claim 24 wherein the analyzer used shared hardware to perform real time monitoring, preparation of statistical information, post-capture analysis and replaying saved traffic from a transmission medium.

36. An replay analyzer comprising:  
a data input port for receiving data,  
a trace buffer for storing data,  
term logic,  
at least one event statistic counter,  
selective capture logic for determining which data to store in said trace buffer,  
replay logic for replaying data stored in said trace buffer, and  
a trigger for triggering on a match with replayed data.

37. An analyzer as recited in claim 36 further comprising a timestamp counter.

38. An analyzer as recited in claim 36 further comprising a timestamp upcounter.

39. An analyzer as recited in claim 36 further comprising a control port for allowing user control of the analyzer.

40. An analyzer as recited in claim 36 wherein said replay trigger includes the ability to identify specific data values or events.

41. An analyzer as recited in claim 36 further comprising an adapter pod for connecting the analyzer to a transmission medium.

42. An analyzer as recited in claim 36 wherein said term logic performs pattern recognition for the analyzer.
43. An analyzer as recited in claim 36 wherein said event statistic counter provides long term statistics regarding types of events that are occurring, each event type being defined by a term.
44. An analyzer as recited in claim 43 wherein said terms are selected from the group consisting of command packets, addresses, data transfers, and signal assertions.
45. An analyzer as recited in claim 36 wherein said selective capture logic uses terms from said term logic to capture only incoming activity that matches predefined or user patterns.
46. An analyzer as recited in claim 36 further comprising a trigger sequencer that is capable of triggering said trigger.
47. An analyzer as recited in claim 46 wherein said trigger sequencer can terminate writing to or reading from said trace buffer.
48. An analyzer as recited in claim 36 wherein the analyzer has a capture mode and a replay mode that are user-selectable.
49. An analyzer as recited in claim 36 wherein said replay logic permits selection data flow source and direction.
50. An analyzer as recited in claim 49 wherein said data flow source and direction may be selected from (i) a flow starting at said data input port, and to said term logic and said trace buffer, or (ii) from said trace buffer to said trigger.
51. An analyzer as recited in claim 36 further comprising a replay output port.
52. An analyzer as recited in claim 51 further comprising an output adapter pod;

wherein said replay output port and said output adapter pod are in data communication with each other so that data may exit the analyzer through said output port and through said output adapter pod to a bus in order to facilitate traffic generation on a bus.

53. An analyzer as recited in claim 52 wherein activity stored in said trace buffer may be used to generate traffic on a bus.

54. An analyzer as recited in claim 36 further comprising a control port through which a local or remote user can configure analyzer logic.

55. An analyzer comprising:

- a control port to permit user configuration of the analyzer,
- a data input port for receiving data from a transmission medium,
- a trace buffer for storing data from said data input port,
- trace buffer control logic for determining which data from said data input port to store in said trace buffer,
- replay logic for replaying data stored in said trace buffer, and
- term logic for matching a desired term with replayed data.

56. An analyzer as recited in claim 55 further comprising a selective capture feature.

57. An analyzer as recited in claim 55 wherein said term logic performs event pattern recognition.

58. An analyzer as recited in claim 57 wherein said events are selected from the group consisting of high, low, rising edge, falling edge, either edge and dontcare.

59. An analyzer as recited in claim 55 further comprising selective capture logic.

60. An analyzer as recited in claim 55 wherein the analyzer has at least one data capture mode selected from the group consisting of state mode, transitional timing mode, and fixed frequency mode.

61. An analyzer as recited in claim 55 further comprising trigger logic that asserts a trigger signal when data presented to it matches a predefined pattern or sequence.
62. An analyzer as recited in claim 55 further comprising stop logic.
63. An analyzer as recited in claim 55 further comprising trigger logic.
64. An analyzer as recited in claim 55 further comprising a trigger sequencer that uses state machine architecture to trigger on an event.
65. An analyzer as recited in claim 55 further comprising an event statistics counter which generates statistical information based on replayed data.
66. An analyzer as recited in claim 55 wherein said replay logic selects whether data presented to internal functions of the analyzer comes from said trace buffer or from said data input port.
67. An analyzer as recited in claim 55 wherein said trace buffer control logic includes stop logic, an address controller, and a memory controller.
68. An analyzer as recited in claim 55 wherein said trace buffer control logic latches an address value of replay data.
69. An analyzer as recited in claim 68 wherein said address value is latched to a FIFO.
70. An analyzer as recited in claim 55 wherein the analyzer is capable of replaying traffic using the same timing that it was captured with.
71. An analyzer as recited in claim 55 wherein the analyzer can perform any decoding, flagging, finding, sorting, statistics and filtering operations of which it is capable using triggering and counting hardware that are also used for data capture purposes.